

SUPPORT FOR THE AMENDMENTS

Claims 2-9, 19, and 20 have been amended.

Support for the amendment of Claims 2-9, 19, and 20 is provided by the corresponding claims as originally filed. The specification has been amended to insert generic terminology for the tradename VERSENEX 80.

No new matter has been added by the present amendments.

REMARKS

Claims 1-20 are pending in the present application.

The rejection of Claims 1-9 and 16-20 under 35 U.S.C. §102(b) over Nzudie et al, is respectfully traversed.

Nzudie et al relate to the preparation of dispersants based on cationic polymers comprising hydrophobic units (step a)) and the preparation of aqueous dispersions of water-soluble polymers obtained by polymerization of a monomer mixture in the presence of said dispersants (step b)) (see col. 1.1, lines 7-12 of Nzudie et al).

Nzudie et al fail to disclose and/or suggest that the polymers can be synthesized by gel polymerization, as required by Claim 1 of the present application. In contrast, Nzudie et al disclose polymer compositions having a low viscosity and explicitly state that water-soluble polymers in the form of a gel have a very high viscosity (see column 2, lines 24-27; column 1, lines 18-21 of Nzudie et al).

Further, Nzudie et al do not even suggest that the polymers can be synthesized by adiabatic polymerization, as Claim 1 of the present application. In contrast, according to Nzudie et al the temperature is carefully adjusted so that the process proceeds at constant temperature (isothermic). For example, in Example 1 of Nzudie et al the reactor is brought to 65°C over 30 minutes. The temperature is maintained at 65°C for 2 h. After further initiator has been added, the temperature is raised to 80°C and after reaction for 1 and a half hours at 80°C, further initiator is added. After 1 and a half hours, this last operation is repeated and the temperature is maintained for 1 hour. The mixture is then cooled to 30°C and the reactor is emptied (Nzudie et al, column 6, lines 41-47).

Therefore, the water-soluble polymers according to Nzudie et al are not prepared by adiabatic polymerization techniques.

With respect to the product-by-process limitations of the presently claimed invention, the courts have enunciated that: “Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claims is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 227 USPQ 964 (Fed. Cir. 1985).

There are two important aspects to the *In re Thorpe* standard. First, the products in the “product-by-process” claim must be identical or an obvious variant thereof. Second, patentability of a product may not depend on its method of production, but the method of production cannot be disregarded if that method provides a distinct structure or product. Indeed, the Board and the Courts have said as much, which is set forth in MPEP §2113 in relevant part:

“The structure implied by the process steps should be considered when assessing the patentability of product-by-process claims over the prior art, especially where... the manufacturing process steps would be expected to impart distinctive structural characteristics to the final product. See, e.g. *In re Garnero*, 412 F.2d 276, 279, 162 USPQ 221, 223 (CCPA 1979)... The Board stated that the dispositive issue is whether the claimed factor exhibits any unexpected properties compared with the factor disclosed by the prior art.” (citing *Ex parte Gray*, 10 USPQ2d 1922 (Bd. Pat. App. & Inter. 1989)

The foregoing is particularly relevant to the present application, as there are clear differences between the method disclosed by Nzudie et al and the method of the present invention.

Adiabatic gel polymerization yield products that differ from products obtained by isothermal emulsion polymerization. Therefore, the polymer composition according to Claim 1 of the present application that is obtained by adiabatic gel polymerization (product-by-process) is not identical to the water-soluble polymers according to Nzudie et al. Adiabatic

gel polymerization yields new products having properties that differ from the properties of comparative products which have been synthesized, e.g., by isothermal solution polymerization.

The present application contains comparative experimental data concerning the dewatering-efficiency of the polymer compositions. The properties of polymer compositions according to the invention, i.e., polymerized by **adiabatic gel** polymerization (present application, pages 13/14, inventive polymers 7-13), are compared to the properties of comparative polymer compositions that have **not** been polymerized by adiabatic gel polymerization (present application, page 16, comparative polymers 5-9).

The results are summarized in the tables here below adapted from the present application, pages 19-21, application examples 4 and 5:

| Example | t _E | clarity | t _E | clarity | t _E | clarity |
|-------------------------|----------------|---------|----------------|---------|----------------|---------|
| [kg(WS)/t TS] | 3.7 | | 4.4 | | 5.2 | |
| [g(WS)/m ²] | 160 | | 170 | | 180 | |
| Comp. 5 | >100 s | 0 | >100 s | 0 | >100 s | 0 |
| Comp. 6 | >100 s | 0 | >100 s | 0 | >100 s | 0 |
| Comp. 7 | >100 s | 0 | >100 s | 0 | >100 s | 0 |
| Inventive 7 | 35 s | 40 | 16 s | 46 | 9 s | 46 |
| Inventive 8 | 38 s | 44 | 16 s | 46 | 12 s | 46 |
| Inventive 9 | 24 s | 44 | 16 s | 46 | 8 s | 46 |
| Inventive 10 | 26 s | 44 | 16 s | 46 | 10 s | 46 |

t_E = dewatering time (time needed for 200 mL filtrate)

| Example | t_E | clarity | t_E | clarity | t_E | clarity |
|-------------------------|--------|---------|--------|---------|--------|---------|
| [kg(WS)/t TS] | 4.8 | | 5.2 | | 5.5 | |
| [g(WS)/m ²] | 160 | | 170 | | 180 | |
| Comp. 8 | >100 s | 0 | >100 s | 0 | >100 s | 0 |
| Comp. 9 | >100 s | 0 | >100 s | 0 | >100 s | 0 |
| Inventive 11 | 17 s | 34 | 12 s | 40 | 10 s | 46 |
| Inventive 12 | 21 s | 31 | 18 s | 36 | 13 s | 40 |
| Inventive 13 | 23 s | 32 | 19 s | 35 | 26 s | 39 |

t_E = dewatering time (time needed for 200 mL filtrate)

In view of the foregoing, it is evident that comparative polymers 5-9 that have *not* been polymerized by adiabatic gel polymerization require extended dewatering times (> 100s) and do not clarify industrial sludges (clarity =0). The inventive polymers 7-13, however, allow for shortened dewatering times (≤ 38 s) at a very efficient clarification (clarity ≥ 31).

Accordingly, Applicants submit that it can be concluded that, as far as dewatering times and clarity of the sludge is concerned, the polymer compositions according to the invention which are polymerized by adiabatic gel polymerization are superior over conventional polymer compositions which are not polymerized by adiabatic gel polymerization. The polymer composition according to the present invention can be distinguished from the polymer compositions of Nzudie et al, e.g., by measuring the dewatering performance and the clarification efficiency, respectively.

In view of the foregoing, Applicants submit that the polymer compositions according to the present invention is not anticipated by Nzudie et al.

Withdrawal of this ground of rejection is requested.

The rejections of (a) Claims 10, 11, 14, and 15 and (b) Claims 12 and 13, both, under 35 U.S.C. §103(a) over Nzudie et al in view of Chmelir et al, is respectfully traversed. The disclosure of Nzudie et al is discussed above. At the outset, Chmelir et al do not compensate for the deficiencies in Nzudie et al and, therefore, the claimed invention is not obvious.

The present invention relates to powdery, water-soluble, cationic polymers composed of at least two different cationic polymer components, which are different in terms of cationic components and molecular weight. as well to a method for production of same and to the use of the polymer products for solid-liquid separation, for example as a retention aid in paper manufacture, and in sludge dewatering/wastewater purification (present application, page 1, lines 4-10).

In the practice of solid-liquid separation, the object is to achieve, by addition of flocculating auxiliaries, the best possible result in terms of the parameters dry substance of the solid and clarity of the filtrate, or in other words to bring about the most complete separation possible of solid from the liquid phase. Sludge dewatering on a chamber-type filter press can be regarded as an example of the importance of these parameters. Since the dried sludge must be transported and often put to beneficial use by thermal processing, the highest possible content of solid (dry-substance content) is desired. In addition, the separated filtrate must be delivered to disposal. The quality and simplicity of such disposal increase as the clarity of the filtrate increases, or in other words as the content of unflocculated solids remaining in the filtrate becomes lower. In such a case the filtrate can be discharged directly from a clarifying plant to the environment, and does not have to pass through the clarifying plant once again. Occasionally a flocculating auxiliary produces a flocculated sludge with

high solid content but unsatisfactory clarification of the supernatant. The situation may be the reverse for another flocculating agent (present application, page 1, lines 12-26).

Flocculating auxiliaries are produced in the form of powdery granules or water-in-water or water-in-oil emulsions, and prior to their use are added in dilute aqueous solutions to the medium to be flocculated. Powdery granules are preferred, since they can be transported more inexpensively by virtue of their almost anhydrous condition and, as in the water-in-oil-emulsions, do not contain any oil or solvent constituents that are insoluble in water (present application, page 1, lines 28-33).

It was an object of the present invention to provide powdery cationic flocculation auxiliaries that are improved compared with the prior art and that are composed of a low molecular weight polymer constituent and a high molecular weight polymer constituent (patent application, page 3, lines 6-13).

This object is solved by the subject-matter of amended claim 1, i.e. by a powdery, water-soluble, cationic polymer composition comprising: at least two cationic polymers of different composition in the cationic groups, wherein a first cationic polymer is formed by radical polymerization of monomer constituents in the presence of a second cationic polymer in an aqueous solution,

- wherein the polymerization of the first cationic polymer takes place in an aqueous solution of the second cationic polymer according to the method of adiabatic gel polymerization, and
- the ratio of the second to the first cationic polymer is between 0.01:10 to 1:4.

Applicants have surprisingly found that according to the inventive polymerization procedure, there are obtained polymers with decisively better product properties than were measured for products according to conventional products that were synthesized by

conventional polymerization procedures such as isothermal polymerization (see present application, page 8, line 32 to page 9, line 2; pages 1022, examples).

Further, the inventive polymers have a better effect on conditioning and dewatering of communal or industrial sludge when rate of filtration and clarity of the filtrate are considered as the two parameters for effect (present application, page 19, lines 5-8 and page 20, lines 4-7).

Thus, the polymer compositions that are polymerized by adiabatic gel polymerization are particularly suitable as flocculation auxiliaries in the course of solid/liquid separation and are superior over conventional polymer compositions that have not been polymerized by adiabatic gel polymerization. In particular, they can be used suitably for purification of wastewater and for conditioning of potable water. Above and beyond this, they can be advantageously used as retention auxiliaries in flocculation processes during paper manufacture (present application, page 9, lines 29-33).

The advantages of the polymer compositions according to the invention are further illustrated by the examples contained in the description of the present application. Some essential results concerning dewatering time and clarification performance have already been summarized in the tables under item 3.3 *supra*. Furthermore, both Nzudie et al and Chmelir et al merely refer to water-in-water emulsion polymerization techniques.

There is no disclosure or suggestion in Nzudie et al and Chmelir et al guiding the skilled artisan to adiabatic gel polymerization techniques, let alone that the thus obtained polymer compositions are superior with respect to dewatering and clarification performance. Thus, the presently claimed invention would not be obvious in view of the combined disclosures of Nzudie et al and Chmelir et al.

The Examiner further takes the position that the subject-matter of method Claims 10-11 and 14-15 would be obvious over Nzudie et al and Chmelir et al. According to Claim 10

of the present application, the starting temperature for the polymerization is adjusted to a range of -10°C to 25°C.

Nzudie et al disclose that the polymerization temperature may vary within a wide range, i.e. from -40°C-200°C and preferably between 50 and 95°C (see Nzudie et al column 5, lines 21-23).

The Examiner takes the position that the starting temperature would not be disclosed by Nzudie et al and therefore assumes that it will be room temperature which falls within the scope of Claim 10.

Since the polymerization of the monomer components QUATBZ and acrylamide as well as butyl acrylate according to Example 1 of Nzudie et al is achieved in the presence of the dispersant containing a QUATMC/styrene copolymer, QUATMC of said copolymer may be regarded as the *second cationic polymer* according to Claim 1 of the present application. Consequently, the cationic polymer formed of the monomers QUATBZ and acrylamide as well as butyl acrylate may be regarded as the *first cationic polymer* according to Claim 1 of the present application.

Example 1 according to Nzudie et al explicitly discloses that the mixture of QUATMC/styrene copolymer is introduced into a reactor and the reactor is brought to 65°C. After that, the monomer components QUATBZ and acrylamide as well as butyl acrylate are added to the QUATMC/styrene copolymer solution.

Therefore, it is evident, that the starting temperature for the polymerization according to Nzudie et al for all disclosed examples is 65°C which is not within the scope of present Claim 1.

Furthermore, it is crucial that the temperature for the polymerization reaction is adjusted to a range of -10°C to 25°C., because higher start temperatures lead to polymer gels

which are too soft to be further processed in the subsequent size-reduction and drying processes (see present application text, page 7, paragraph 4).

In view of the foregoing, Applicants submit that the presently claimed invention would not be obvious in view of the combined disclosures of Nzudie et al and Chmelir et al.

Withdrawal of these ground of rejection is requested.

The provisional obviousness-type double patenting rejection of Claims 1-18 over Claims 1-17 of co-pending U.S. 10/567,909, is respectfully traversed.

The Examiner has provisionally rejected Claims 1-18 of the present application over Claims 1-17 of U.S. 10/567,909. Applicants disagree.

Claim 1 of the present application is drawn to:

A powdery, water-soluble, cationic polymer composition comprising:
at least two cationic polymers of different composition in the cationic groups, wherein a first cationic polymer is formed by radical polymerization of monomer constituents in the presence of a second cationic polymer in an aqueous solution,
wherein the polymerization of the first cationic polymer takes place in an aqueous solution of the second cationic polymer according to the method of adiabatic gel polymerization, and the ratio of the second to the first cationic polymer is between 0.01:10 and 1:4.

Claim 1 of U.S. 10/567,909 is drawn to:

1. A powdery, water-soluble, cationic polymer composition comprising at least a first and a second cationic polymer, wherein the first and the second cationic polymers differ in molecular weight, wherein the first cationic polymer is formed by radical polymerization of its monomer constituents in the presence of the second cationic polymer in aqueous solution,
wherein ***the first and second cationic polymers comprise corresponding structural units***,
wherein the polymerization of the first cationic polymer takes place in an aqueous solution of the second cationic polymer according to the method of adiabatic gel polymerization, and wherein the ratio of the second to the first cationic polymer is from 0.01:10 to 1:3.

Although there is an overlap in the ratios of the first and the second cationic polymer between the two independent claims of each application, the cationic polymers themselves differ from each other. Specifically, in the present invention the first and second cationic polymer are polymers of a different composition in the cationic groups. In direct contrast, in U.S. 10/567,909, the first and second cationic polymer comprise corresponding structural units.

Therefore, the claims of the presently claimed invention and claims of U.S. 10/567,909 are not only different, but also patentably distinct from each other.

Withdrawal of this ground of rejection is requested.

The objection to the specification for the format of the tradename "Versenex 80" is obviated by amendment herein. "Versenex 80" has been amended to recite "VERSENEX 80 (a chelating agent which is an aqueous solution of the pentasodium salt of diethylenetriaminepentaacetic acid)". Withdrawal of this ground of objection is requested.

The objection to Claim 5 is obviated by amendment. Applicants have amended Claim 5 to delete the "preferable" limitation. Withdrawal of this ground of objection is requested.

Application Serial No. 10/567,664
Response to Office Action mailed November 14, 2008

Applicants submit that the present application is now in condition for allowance.

Early notification of such action is earnestly solicited.

Respectfully submitted,

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